CLAIMS

1. A control for a glass forming machine which includes a blank station for forming a parison from a gob of molten glass having at least one mechanism, a blow station for forming a parison into a bottle, having at least one mechanism, a feeder system including a shear mechanism for delivering a gob to the blank station, a mechanism for transferring a parison from the blank station to the blow station and a takeout mechanism for removing a bottle from the blank station,

wherein the machine has a set cycle time,

wherein each of the mechanisms is cycled within the time of one machine cycle,

wherein the duration of each displacement of each of the mechanisms is determinable,

wherein interferences exist between the motion paths of the gob, the parison, the bottle and individual mechanisms,

wherein at least one displacement of at least one of the mechanisms is divided up into at least two submotions which locates an interference with the gob, the parison, the bottle or another mechanism,

wherein the thermal forming of the parison and bottle involve a number of thermal forming processes occurring during the time of one machine cycle and having finite durations, and

wherein process air is supplied for at least one process for a finite duration by turning a supply valve "on" and then "off" during the time of one machine cycle,

wherein the start of displacement of the mechanisms and the turning of the valves "on" and "off" are events which are started in a selected sequence, and

wherein an unwrapped bottle forming process wherein a gob of molten glass is sheared from a runner of molten glass, the gob is then formed into a parison in the blank station, the parison is then formed into a bottle in the blow

station, and the bottle is then removed from the blow station, takes more than the time of one machine cycle to complete, comprising

a computerized model of a mathematical representation of a network constraint diagram of the unwrapped bottle forming process, and

computer analysis means for analyzing the computerized model as a constrained optimization problem for determining, with inputs including the following:

1. the motion durations,

2. the submotion durations,

3. the machine cycle time,

4. the event time in an unwrapped bottle forming process for each displacement to begin and for each valve to be turned "on" and "off", and

5. the target time for an optimized machine cycle,

an alternate machine cycle time for a feasible schedule in an unwrapped bottle forming process and the event time in the feasible schedule for each displacement to begin and for each valve to be turned "on" and "off".

2. A control for a glass forming machine according to claim 1,
wherein the target time for an optimized machine cycle is faster then a possible machine cycle time for a feasible schedule.

3. A control for a glass forming machine according to claim 1, further comprising

input means for inputting

1. the motion durations,

2. the submotion durations,

3. the machine cycle time,

4. the time in an unwrapped bottle forming process for each displacement to begin and for each valve to be turned "on" and "off" and

5. the target time for an optimized machine cycle.

4. A control for a glass forming machine according to claim 1, further comprising wrapping means for wrapping the times in an unwrapped bottle forming process for each displacement to begin and for each valve to be turned "on" and "off" into the angles in a machine cycle for each displacement to begin and for each valve to be turned "on" and "off".

5. A control for a glass forming machine according to claim 1, wherein the network constraint diagram has collision and sequence branches and there are the following additional inputs: collision branch duration "N" lower limit and sequence branch duration "N" lower limit.

6. A control for use with a machine which receives an initial product and transforms the initial product into a final product in a plurality of stations,

wherein the machine has a set machine cycle time,

wherein there is at least one mechanism at each station,

wherein each of the mechanisms is displaced from an advanced position to a retracted position and from the retracted position back to the advanced position during the time of one machine cycle,

wherein the duration of each displacement of each of the mechanisms is determinable,

wherein the start of each displacement is an event which is selectively actuated in a selected sequence, and

wherein the operation of the machine has a number of constraints including interferences which exist between the motion paths of individual

mechanisms, the start and end times and the durations of displacement of the mechanisms,

wherein an unwrapped process wherein the initial product is transformed into the final product takes more than the time of one machine cycle to complete,

wherein the displacement of at least one of the mechanisms is divided up into at least two submotions which locates an interference, comprising

a computerized model of a mathematical representation of a network constraint diagram of the unwrapped process, and

computer analysis means for analyzing the computerized model as a constrained optimization problem for determining, with inputs including the following:

1. the motion durations,

2. the submotion durations,

3. the machine cycle time,

4. the event time in an unwrapped process for each displacement to begin, and

5. the target time for an optimized machine cycle,

an alternate machine cycle time for a feasible schedule in an unwrapped process and the event time in the feasible schedule for each displacement to begin.

7. A control for use with a machine according to claim 6, wherein said mathematical representation comprises a mathematical matrix.

8. A control for use with a glass forming machine according to claim 6, wherein, said computerized model means further comprises means for calculating collision margins for each pair of interfering paths.